REMARKS

Claims 1-35 are pending in the application.

Claims 36-39 have been newly added. No new matter is entered.

Claims 29 and 30 are rejected under 35 U.S.C. § 112, first paragraph, stating that the best mode contemplated by the inventor has not been disclosed.

A telephone discussed was had with the Examiner concerning this rejection and the Examiner agreed this rejection should be withdrawn since there is no basis for such a rejection because there is no requirement that the inventor point out what claims represent a best mode nor does the specification provide that claims 29 and 30 are the best mode. In the present invention the specification sets forth the best mode in accordance with the requirements under 35 U.S.C. § 112. It is respectfully submitted there is no basis for a best mode rejection nor any evidence provided for such a rejection.

Claims 7 and 26 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Claim 7 has been amended to correct a typographical error "formation" to "information". Claim 26 is amended to clarify the claimed invention. It is respectfully requested the rejection of claims 7 and 26 under 35 U.S.C. § 112, second paragraph be withdrawn.

Claim Objections

Claim 14 has been objected to as being dependent from a multiple dependent claim. Claim 14 is amended to depend from claim 10.

Several of the claims are objected to as being substantially duplicate of another claim. It is respectfully requested these objections be withdrawn since these claims are not substantial

duplicates. For example claim 1 provides: inter-highway pointer control unit for indicating a start-of-scheduling input line. Claim 2 provides inter-highway pointer control unit for indicating a start-of-scheduling output line. Claim 1 provides starting the retrieval of the output lines indicated by the forwarding request information and starting from the output line indicated by said intra-highway pointer control unit, whereas claim 2 recites: starting the retrieval of the input lines indicated by the forwarding request information and starting from the input line indicated by said intra-highway pointer control unit.

Claim 6 provides a request management control unit which is not found in claim1.

Claims 1 and 9 are suggested as being substantially duplicates yet each claim has a different rejection.

It is respectfully requested all the claim objections be withdrawn because all the claims are different.

Prior Art Rejections

Claims 1-7, 10-15, 17-28 and 31-35 are rejected under 35 U.S.C. § 102(e) as being anticipated by Oba et al. (Oba).

Oba describes a packet scheduler with a plurality of packet queues for storing packets. A management unit schedules information specifying the order to read out the packets from the packet queues at the time of packet transmission. Oba describes several scheduling techniques such as the length of the queue, the weight of a corresponding queue, and class scheduling queuing.

Oba does not relate to a scheduling method of an input buffer switch having a Virtual Output Queue (VOQ) as an object of the present invention recited in claims1-7, 10-15, 17-28 and 31-35.

Oba discloses and relates to a scheduling method and apparatus for reading out a packet from a plurality of queues in sequence or in a single line. The structure and control method described in Oba cannot execute scheduling of the input having the VOQ.

In contrast to Oba the present invention provides multiple pointers, for example claim 1 has an inter-highway pointer control unit for indicating the input line where input line scheduling should start and an intra-highway pointer control unit which is a pointer for each input line and indicates for each input line the starting output line where scheduling should begin.

These features are not disclosed anywhere in Oba.

In the scheduling method of Oba, the reading out of the queue is determined by an algorithm based on the present length of the queue and the weight of a corresponding queue (value preset in each queue) at the time of packet arrival and at the time of reading out the packet.

Further, the packet is transmitted from a queue indicating a scheduling result by reading out the scheduling result from a FiFo in each packet time. The scheduling result (object queue number to be read out) is stored in the FiFo of a scheduling unit.

Oba discloses executing the scheduling process at the time of both packet arrival and reading out the packet and determining a transmission queue using an algorism based on the present length of a queue and the weight of a corresponding queue.

In contrast, in the present invention, the scheduling process is executed only when the packet arrived.

The present invention is characterized by determining an input line for a scheduling object using pointer #1 (inter highway pointer), and determining VOQ in the input line using pointer #2 (intra-highway pointer) by a round robin method.

According to the present invention, it is possible to determine the VOQ in the input line at high speed because a complex algorism using the length of queue and weight, and so on is not necessary.

In Oba, the scheduling result is stored in a FiFo of the scheduling unit and read out in the First In First Out method. Oba also discloses a method for reading out the scheduling results at random as shown in Figs.8A-8D. That is, Oba does not simply use the First In First Out method to read out the scheduling results.

The structure taught by Oba for reading out the scheduling result at random has a scheduler unit including a FiFo memory storing a plurality of scheduling results, a pointer indicating a FiFo for writing and a pointer indicating a FiFo for reading out.

The scheduling result is read out at random by causing the pointers to circulate to distribute the scheduling results to the FiFo for writing the scheduling result and the FiFo for reading out the scheduling result.

In contrast, the present invention does not need such structure for reading out the scheduling result at random like Oba.

In the present claimed invention the pointers defined in each of claims of the present invention are a pointer (inter highway pointer) for indicating start-of-scheduling input line and a pointer (intra highway pointer) for indicating VOQ that grants a read-out right by highest priority in the selected input line.

Oba does not teach the structure nor method of usage of the pointers as claimed in the present claims. The pointer defined in the claims are entirely different between the present invention and Oba.

With regard to claims 10-15, Oba discloses using a preset bandwidth weight parameter based when scheduling to fairly execute the scheduling for different bandwidth queues.

In contrast, the present invention provides a load observation structure to fairly execute the scheduling for different bandwidth queues and executes the scheduling based on a result of a real load observation in a predetermined cycle.

In applicant's claimed invention the scheduling processing unit includes counts the number of packets arrived within a fixed cycle per logical forwarding request information of each input line, and performs the scheduling of a next cycle in accordance with the number of packets counted by said load observing unit.

These features are not found in the prior art.

With regard to claim 17, Oba teaches providing the FiFo for storing scheduling results in each QoS class in order to execute QoS control and preferentially reading the FiFo for storing the scheduling result of a QoS class having higher priority.

In contrast, as for QoS control claimed in 17, the scheduling is executed to a line holding a higher priority class request. Sequentially, a scheduling is again executed to a line holding a lower priority class request.

Claims 8, 9, 16, 29 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oba in view of Lyles et al. (Lyles).

The Office Action asserts Lyles shows the scheduling processing units each independently executing a pipe line process. Lyles describes a reservation ring, however Lyles does not a describe the scheduling processing unit is controlled by an inter-highway pointer control unit.

Further, neither of the cited references relate to a scheduling method of an input buffer switch having a Virtual Output Queue (VOQ) as claimed in claims 8, 9, 16, 29 and 30.

As pointed out above Oba discloses a scheduling method in a single line. Lyles discloses a scheduling method of an input buffer switch with a single buffer. The system and method of Lyles is described in the background of the specification of the present application.

Accordingly, even if Oba and Lyles are combined, the present invention of claims 8, 9, 16, 29 and 30 cannot be attained by the combination because the structure of the scheduler and the scheduling method are entirely different between the present invention and the cited references.

The differences between the present invention and a combination of Oba and Lyles is described as follows.

First, the scheduling method of Oba is directed to an algorithm based on the length of the queue and the weight of a corresponding queue.

In contrast, the scheduling method of the present invention is directed to the round robin method based on pointer #2 (intra highway pointer) control.

Further, Lyles discloses repeatedly executing the judgment process N times.

In contrast, in the present invention, sequential control is executed using the pointer #1 (inter highway pointer) control.

Lyles is further different from the claimed invention because Lyles discloses a scheduling method and apparatus that reads a packet so that packets are not transmitted from a plurality of queues to a same output line when the packet is transmitted from a plurality of input buffers each of which does not have Virtual Output Queue.

In this scheduling method of Lyles, each scheduler compares a self-output request line number (RA) with circular data (SA). If RA and SA are coincident and it is not competing with other input lines (counter value is not more than a predetermined value), it is judged that a transmission right is acquired. If the counter value is more than the predetermined value, it is judged that a transmission right is not acquired because of competition.

An adjacent scheduler receives this SA using a reservation ring and the same processing is repeated N times (N is the number of lines) to judge whether competition occurs with other input lines.

The structure of Lyles provides that the direction for circulating the SA is one direction, therefore, it is difficult to fairly execute the scheduling between the input lines.

Further in Lyles, if a transmission right for a line is not granted, a flag is set for the line, thereby to preferentially grant the transmission right at the next scheduling cycle.

Thus Lyles discloses simultaneously executing transmission right judgment process by N schedulers (evaluators) and repeatedly executing the judgment process N times by circulating the SA. However, the scheduling is not fairly executed to same input line number because the direction for circulating the SA is one direction.

Lyles compensates for thus, as above mentioned, by setting a flag to a line in which the transmission right is not granted, to preferentially granting the transmission right at the next scheduling cycle.

In contrast, in applicant's claimed invention in order to determine the transmission line, for example claim 8 a scheduling process starts from an input line indicated by pointer #1 (inter highway pointer) and VOQ in the input line selected according to pointer #2 (intra highway

pointer) is selected by round robin method in a condition that transmission request exists and it is not selected by other input lines.

This scheduling processing is repeatedly executed for the N input lines in a sequential manner.

To avoid a problem that an order of input line becomes uniform, the present invention is characterized by circulating pointer #1 in each scheduling cycle.

Also, in a pipeline processing of claims 8, 9, 16, 29 and 30, independent inter-highway pointer in each pipeline processing is provided, start pointer values are preset in different values, a processing order is reversed in each predetermined cycle.

Another difference is provided because Lyles discloses that one of N schedulers (evaluators) must execute judgment N times in one scheduling cycle. That is, the judgment is repeated N*N times as a total number of judgments for all evaluators.

In contrast, the present claims are recite that the judgment process is executed by one scheduler, one time in one scheduling cycle. That is, the judgment is repeated N times as a total number of judgments for all schedulers.

Also in contrast to Lyles, the present claims recite that the process for each input line is executed with a pipeline process whereas in Lyles it is assumed that a pipeline processing is used to repeatedly execute the above-mentioned judgment process N times.

As above-mentioned, since each scheduler executes the judgment one time in a scheduling cycle, a scheduling judgment process of the next scheduling cycle can be executed immediately after the judgment process is completed.

However, since the pipeline process itself is well known, the inventor thinks that it is desirable to define specific structure and control method of the present invention.

Lyles discloses a reservation ring to notify information to the adjacent scheduler. However, the present invention of pending claims is characterized by providing a delay control structure and a selector function to the scheduler in order to expand functions of the scheduler without defining the reservation ring itself.

Please charge the amount of $174.00 to deposit Account No. 50-1290 for extra claims.

In view of the remarks set forth above, this application is in condition for allowance which action is respectfully requested. However, if for any reason the Examiner should consider this application not to be in condition for allowance, the Examiner is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper may be charged to Deposit Account No. 50-1290.

Respectfully submitted,

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